REMARKS

I.   Introduction

By the present Amendment, claim 1 has been amended. No claims have been added or cancelled. Accordingly, claims 1-4, 6-8, 10, and 11 remain pending in the application. Claim 1 is independent.

II.   Office Action Summary

In the Office Action of October 1, 2008, claims 1-4, 6-8, 10, and 11 were rejected under 35 USC §101 as being directed to non-statutory subject matter. Claim 1 was rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. Claims 1-2, 4, 7, 8, and 11 are rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,466,700, issued to Makram-Ebeid in view of with U.S. Patent No. 6,151,417 issued to Florent, and further in view of U.S. Patent Application No. 2002/0181797 to Young. Claims 3, 6, and 10 were rejected under 35 USC §103(a) as being unpatentable over Makram-Ebeid in view of Florent and Young, and further in view of U.S. Patent No. 6,724,943 issued to Tsuchiya et al. ("Tsuchiya"). These rejections are respectfully traversed.

III.   Rejections under 35 USC §101

Claims 1-4, 6-8, 10, and 11 were rejected under 35 USC §101 as being directed to non-statutory subject matter. Regarding this rejection, the Office Action indicates that the claims recite mere manipulation of data or data without a limitation to a practical application. In particular, the Office Action indicates that there is no physical transformation claimed in independent claim 1.

By the present Amendment, Applicants have amended independent claim 1 to better define the invention, in part, with respect to statutory subject matter. As can be appreciated, the present invention provides an image processing device capable of enhancing the contrast of medium to fine details of an image. In this regard, this claim is directed to an apparatus, and believed to be clearly directed to statutory subject matter.

Notwithstanding the foregoing, independent claim 1 has been amended to further recite, "means for outputting the image whose low-frequency components are compressed to a monitor." As the device being claimed is intended to enhance the contrast of images, the ability to view the enhanced image clearly constitutes a useful/tangible result, as well as a physical transformation.

Withdrawal of this rejection is therefore respectfully requested.

IV.   Rejections under 35 USC §112

Claim 1 was under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. Regarding this rejection, the Office Action indicates that it is unclear how the arithmetic means calculates/manipulates the "unsharpened image" along with the "input image". The Office Action further indicates that it is unclear how "an input image" is subtracted from an "unsharpened image" before "the input image" while using an "output image" of the low-frequency compression components. The Office Action provides citations to various portions of the Disclosure that appear to clarify these limitations.

By the present Amendment, Applicants have amended independent claim 1 to better define the instances of indefiniteness raised in the Office Action. Furthermore,

the amendments have been made such that they are consistent with the specification and passages cited in the Office Action.

Withdrawal of this rejection is therefore respectfully requested.

V.   Rejections under 35 USC §103

Claims 1-2, 4, 7, 8, and 11 are rejected under 35 USC §103(a) as being unpatentable over Makram-Ebeid in view of Florent, and further in view of Young. Regarding this rejection, the Office Action indicates that Makram-Ebeid discloses an image processing device that includes a recursive filtering means for smoothing an input image, and that the recursive filtering means includes edge setting means for setting at least one edge having a predetermined angle from a scanning line direction of the input image. The Office Action further indicates that Makram-Ebeid discloses control means for smoothing the image in correspondence with the edge set by the edge setting means. Florent is relied upon for disclosing a low frequency component compression means for setting the amount of compression of low frequency components of the input image according to the output of the recursive filtering means. Young is relied upon for disclosing an arithmetic means for compressing the low-frequency components of the input image by subtracting an input image which is input frame-by-frame from an unsharpened image at a corresponding address one line before the input image using an output of the low-frequency component compression means. Applicants respectfully disagree.

As amended, independent claim 1 defines an image processing device that comprises:

> recursive filtering means for smoothing an input image, the
> recursive filtering means including:

           edge setting means for setting at least one edge having a predetermined angle from a scanning line direction of the input image; and

           control means for smoothing the image to be smoothed in correspondence with the edge set by the edge setting means, the control means including means for calculating a difference value between the input image inputted frame-by-frame and an input image at corresponding address one line before, means for multiplying the difference value by a coefficient corresponding to the difference value, means for shifting the input image at the corresponding address one line before in correspondence with the edge set by the edge setting means, and means for adding the difference value multiplied by the corresponding coefficient to the input image at the corresponding address one line before, which is shifted by the means for shifting, and outputting a result of the addition as an unsharpened image;

           low-frequency component compression means for setting an amount of compression of low-frequency components of the input image according to an output of the recursive filtering means;

           arithmetic means for compressing the low-frequency components of the input image by subtracting the unsharpened image at a corresponding address one line before the input image from the input image inputted frame-by-frame using an output of the low-frequency component compression means; and

           means for outputting the image whose low-frequency components are compressed to a monitor.

The image processing device of independent claim 1 includes recursive filtering means for smoothing an input image. The recursive filtering means includes edge setting means for setting at least one edge having a predetermined angle from a scanning line direction of the input image, and control means for smoothing the image in accordance with the edge set by the edge setting means. The control means also includes means for calculating a difference value between the input image inputted frame-by-frame and an input image at a corresponding address that is one line before, means for multiplying the difference value by a coefficient corresponding to the difference value, means for shifting the input image at the corresponding address one line before in correspondence with the edge set by the

edge setting means, and means for adding the difference value multiplied by the corresponding coefficient to the input image at the corresponding address one line before, which is shifted by the means for shifting, and outputting a result of the addition as an unsharpened image. A low frequency compression means is provided for setting an amount of compression for the low frequency components of the input image according to an output of the recursive filtering means. An arithmetic means is also provided for compressing the low frequency components of the input image by subtracting the unsharpened image at a corresponding address one line before the input image from the input image inputted frame-by-frame, using an output of the low frequency component compression means. Furthermore, the image processing device includes means for outputting the image whose low-frequency components are compressed to a monitor.

The Office Action alleges that the combination of Makram-Ebeid, Florent, and Young discloses various features of the claimed invention. This does not appear to be the case. Makram-Ebeid discloses an image processing method for preserving the edges of objects and for reducing noise. An intensity image is acquired in the form of a multi-dimensional matrix of points, and an intensity gradient is determined at each point. The intensity gradient is determined by its direction and modulus. According to Makram-Ebeid, the entire digital image is acquired. Next, scanning is performed in two directions perpendicular to a direction of the intensity gradient. The smoothing process is only performed after the scanning is complete. See col. 4, lines 28-40, and col. 8, lines 25-65.

Furthermore, Applicants' review of Florent has failed to reveal any disclosure for performing the smoothing process in parallel with a line-by-line scanning of the image. Young discloses a method of improving breast cancer diagnosis using

-11-

contrast enhancement. However, Young is unrelated to recursive filtering. Consequently, there is no motivation for combining the teachings of Makram-Ebeid and Florent with those of Young to arrive at the claimed invention. Even if these references were properly combinable, they would fail to provide any disclosure or suggestion for all the features of the claimed invention.

Contrary to the cited references, the image processing device of independent claim 1 performs the smoothing process line by line while the image is being scanned. See paragraph [0026] and Fig. 2 of the published application. According to such a feature, it is possible to reduce the calculation amount and time delay, because the amount of image data being processed is reduced. This is in contrast to Makram-Ebeid and other references which perform the smoothing process after the entire digital image has been acquired. See paragraph [0009].

The cited references simply fail to provide any disclosure or suggestion for features of independent claim 1 such as a smoothing process that is performed in parallel with line-by-line scanning of the image.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2-4, 6-8, 10, and 11 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Claims 3, 6, and 10 were rejected under 35 USC §103(a) as being unpatentable over Makram-Ebeid in view of Young and further in view of Tsuchiya. As previously discussed, however, these claims depend from independent claim 1, and are therefore believed allowable over the art of record. Applicants further note

that Tsuchiya also fails to provide any disclosure or suggestion for the features that are not disclosed by Makram-Ebeid and Young.
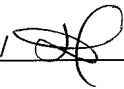
VI.   **Conclusion**

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 1295.44668X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP.

_____/Leonid D. Thenor/_____

Leonid D. Thenor
Registration No. 39,397

LDT/vvr
1300 N. Seventeenth Street
Suite 1800
Arlington, Virginia 22209
Tel: 703-312-6600
Fax: 703-312-6666

Dated: February 2, 2009

-14-